
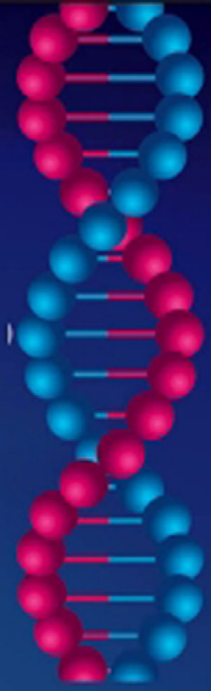


A Comprehensive Guide to

Toxicology in Preclinical Drug Development

Ali S. Faqi

AP

CHAPTER

30

Biostatistics for Toxicologists

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OUTLINE

INTRODUCTION

The objective of this chapter is to develop concepts to aid in the understanding of statistics as it applies to toxicology. First, study design concepts will be reviewed from a statistical perspective, followed by some basic statistical concepts presented in a toxicological context. Next, case studies will be presented for data collected for several different examples of typical toxicology studies to illustrate various statistical principles. These case studies will also be used to highlight the differences, from a statistical perspective, between the various types of toxicology studies.

This chapter is not intended to provide cookbook recipes for applying statistical methods to data collected in toxicology studies. As such, formulas and calculations are kept to a minimum unless used to illustrate a concept. Rather, this chapter is intended to provide a basic foundation of statistical principles that will enable the reader to critically appraise the design, conduct, statistical methodology, and interpretation of various toxicology studies in the literature and in a regulatory environment.

The example data used in the case studies to illustrate concepts have been constructed to reflect real data in terms of magnitude and variation.

Study Design

The goal of statistical experimental design is to get as close as possible to the ideal experiment, given the constraints of feasibility, finite resources, inherent variability in animals, and the ability to extend the results beyond the current experiment. The ideal experiment will generate data to answer the question it was proposed to answer.

Requirements for a good experiment are listed below (see D.R. Cox [1] for further details):

1. Absence of systematic error. This is a requirement to provide an unbiased estimate of the treatment effect through the comparison of nearly equivalent groups,

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